U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF STATISTICS.

A MANUAL OF INSTRUCTIONS

TO

CROP CORRESPONDENTS,

BY

HENRY A. ROBINSON

STATISTICIAN.

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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF STATISTICS,
Washington, D. C., January 5, 1895.

SIR: I have the honor to submit herewith for publication a bulletin designed for the use of the crop correspondents of this division. It contains suggestions for their guidance in replying to the general circulars of inquiry addressed to them monthly. From their replies are consolidated the data in regard to condition of crops and the other statistical estimates which form the basis of our monthly crop reports. These suggestions have been prepared with a view to securing more systematic and uniform methods among the thousands of correspondents of this division who contribute the data upon which our returns are based. They are necessarily, therefore, designed to outline the whole scheme of crop reporting, which forms so important a part of the work of this division, fixing its scope and prescribing its methods.

Respectfully,

HENRY A. ROBINSON,
Statistician.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

CONTENTS.

A MANUAL OF INSTRUCTIONS TO CROP CORRESPONDENTS.

INTRODUCTORY.

In the work of consolidating the returns furnished to the United States Department of Agriculture by its statistical correspondents, and deducing from these returns general conclusions as to the areas under the several crops, the condition of each crop from time to time during the growing season, the product finally obtained, and other matters, it is, of course, assumed that the returns from all correspondents are made up on the same plan; and unless this assumed uniformity of method really exists, the accuracy of the final conclusions reached in the office of the Statistician must be unfavorably affected.

Such uniformity is no doubt fairly well assured by the fact that a large majority of the correspondents are entirely familiar with the system upon which they report; but there may be some who from lack of experience, or through never having seen any detailed explanation of the system, are more or less deficient in their knowledge upon certain points; and, so far as this is the case, it is likely to detract from the desired uniformity of method.

In framing the questions sent out in the circulars issued by the Department care is taken to make them as direct and explicit as possible; but the brevity necessary in these circulars does not admit of devoting any great portion of their space to detailed explanatory matter, while the explanations of our crop-reporting system which have sometimes appeared in the monthly reports of the Statistician were not in a convenient form for ready reference, on account of their being intermixed with articles on other subjects. Indeed, this same circumstance may have caused some correspondents to overlook them altogether; while others may have failed to see them by having been appointed since they were published.

These considerations, coupled with the desire to introduce certain important modifications of the system hitherto in use, with a view to securing greater accuracy of results, have suggested the preparation of a manual devoted to the subject of crop reporting, and published in a form convenient for preservation and reference. The result is herein presented to the statistical correspondents of the Department, whose

public-spirited labors in obtaining information in their respective localities form the groundwork for all its crop statistics, with a view to facilitating those labors, while rendering them more valuable by assuring precision and uniformity in their direction.

The list of correspondents was never so nearly complete as now. They represent almost all producing counties, and include, in all, not less than 11,000 persons who are studying local crop aspects and indicating the prospects of production. It is for the interest of farmers and consumers—of all, except speculators—that crop news shall be as accurate as possible, and the Department counts with confidence on the continued cooperation of the correspondents in the effort to reach the highest attainable standard. Their past labors are appreciated by the Secretary, the Statistician, and the public generally, and the thanks of the Department are cordially extended to them on its own behalf and that of farmers of the country.

GENERAL SUGGESTIONS.

1. Use the circulars received from the Department only for the returns for which they are intended. Make all other communications, including requests for seeds, changes of address, etc., on a separate sheet, of fair size, dated, showing *county*, as well as State and post-office; and when the latter is not in the county for which the report is made, the fact should be stated. The signature should be followed by the words "Statistical Correspondent."

2. Each principal statistical correspondent is instructed to select three or more assistants in different localities of the county he represents, to whom he will distribute such blank circulars as he may receive, calling for information relative to the condition of the crops and other subjects.

3. *Assistant reporters will in all cases make their returns to the principal*, who will compile a report to be forwarded to the Department by averaging the figures and statements of his aids, with such modifications as the extent of territory and amount of product covered by each aid and other circumstances within his own knowledge and judgment may dictate. He should also retain a duplicate copy of his report for future reference, an extra blank being furnished for that purpose. *The reports of assistants should not be forwarded to the Department.*

4. No record of appointments, resignations, or any other changes among assistant correspondents is kept at the Department. Their addresses are asked for when it is desired to communicate with them directly, and need only be given in response to such requests.

5. It is of the utmost importance that the principal correspondents should mail their reports to the Department as nearly as possible upon the day indicated, as tabulations are made from them for publication, and the reports can not be delayed for those which are not promptly returned.

6. The reports of the Department, when published in editions of sufficient size, as well as such new and valuable seeds, etc., as are distributed from time to time, will be sent to each principal correspondent for himself and his assistants.

7. In all cases where a crop mentioned in the circulars of the Department is not raised in the county, or is raised to so small an extent as not to be worthy of notice, the character × may be used in place of figures; but when the reporter simply has not sufficient data for an estimate, the space should be left blank. A cipher (0) indicates an entire failure.

8. In the prosecution of their work as crop reporters, correspondents are invited to note down, with brevity and clearness, any striking fact illustrative of the crop conditions which they report by percentage—any peculiarity of weather, drought, or excessive moisture, prevalence of insects, or other condition favorable or unfavorable to production. It will give a clearer idea of the status of the growing crop and assist greatly in an accurate interpretation of the returns.

REPORT FOR JANUARY.

9. It will be convenient to consider the work of the year in the order in which its results are published, beginning with those which appear in the report of the Statistician for January–February. These relate to the number, average price, and aggregate value of farm animals. The circular upon which the returns on this subject are made is distributed in the month of December, with a view to its return so as to reach the Department as early as the 2d or 3d of the following January. For this purpose it is necessary that it be returned from the Pacific Coast on or about the 24th of December and from nearer points proportionately later, so that from those portions of the country containing a large majority of the population it suffices to forward it on January 1, the date to which the returns relate.

10. The returns as to the number of each class of animals are made in the form of a percentage of the number existing at the same date in the preceding year. The number at that date is represented by 100. If the correspondent estimates that there has been an increase of 5 per cent in the number, he sets down 105 in the proper space in the circular; if he estimates that there has been a decrease of a like percentage, he sets down 95, and so on.

11. As the correspondent does not make an actual enumeration of the animals, he will be largely guided in his estimate by his knowledge of circumstances tending to favor an increase or to cause a decrease in the number. He will have to consider the effects of demand and price, whether in causing animals raised for food to be marketed for slaughter more or less freely, or in encouraging farmers to rear an increased number of such animals, with a view to good prices at a future day

rather than the smaller benefit to be had by an immediate sale. The supply and price of forage and the circumstances of farmers, as tending to induce the one course or the other, will claim attention. The favorable condition of prices which may lead a farmer in straitened circumstances to fatten and sell all his available hogs for slaughter may induce another, who can better afford to wait, to save an increased number of sows for breeding purposes, in the hope that the same favorable condition may continue until he has a much larger number of hogs to fatten.

12. It is not necessary to multiply illustrations. As practical farmers, the statistical correspondents of the Department are familiar with the conditions which tend to cause increase or decrease in the number of each species of farm animals, whether depending on demand and price, supply of feed, the presence or absence of contagious or infectious disease, the financial situation of farmers, or other circumstances. And not only will they consider such points as these, but they and their assistants will as far as practicable learn the actual facts of increase or decrease among their neighbors and other farmers with whom they have opportunity of speaking on the subject.

13. In counties where population is growing by the incoming of new settlers, this fact will be likely to have its influence on the number of live stock. Such settlers often bring horses and other stock with them, or they occasion a demand which leads to the introduction of stock by others.

14. The movement of stock across county lines, which sometimes occurs in consequence of unusual scarcity of forage in one district and comparative abundance in another, merits particular attention in those exceptional seasons in which it becomes important from its magnitude. The records of stock shipped from or brought into a county by rail may in such cases afford a valuable means of information.

15. The figures on prices of farm animals are interesting in themselves, and derive additional importance from the means they afford for comparison between the prices in different States and sections, and the basis they thus furnish for a judgment as to the effects of conditions known to prevail in such States or sections, including climate and other circumstances affecting the cost of maintenance, attention to the improvement of breeds, care, shelter, and proper feeding, and nearness to or remoteness from the markets to which a surplus must ultimately be sent. Then, too, they form, in connection with the statistics of number and the estimated proportions of the animals of different ages, etc., in each species, a basis for the statistics of total value.

16. The question as to the number of sheep killed by dogs, included in the circular on farm animals, deserves careful attention. The figures for the different States, as compiled from the answers to this question, may, when examined in connection with the policies of those States in respect to permitting or restricting the multiplication of dogs, show

the effect of laws for the taxation of these animals, or of other measures having a like end in view, in affording protection against such depredations.

REPORT FOR FEBRUARY.

17. The circular of questions returnable February 1 relates to cotton, and is intended to elicit the information necessary to make a final report upon the crop of *the preceding year*.

REPORT FOR MARCH.

18. A circular issued in February, and made returnable on February 25 from the Pacific Coast or on March 1 from other portions of the country, contains inquiries which, as set forth in the circular itself, "are intended to ascertain approximately the proportionate consumption or distribution of the crops of corn and wheat on the 1st of March, * * * and to show whether they have been greater or less than usual, * * * thus indicating the comparative stocks on hand for future use." One of the objects of this investigation is the furnishing of data which may be useful to farmers having a surplus for sale as a means of judging whether to sell it at the prices current at the time or to hold it for a better market. It is, therefore, of great practical importance that the estimates be made with care and judgment and based upon as full information as it is practicable to obtain.

REPORT FOR APRIL.

19. The circular returnable on April 1 relates to the condition of winter grain and of farm animals. In relation to grain it contains inquiries as to the date of seeding, the conditions under which it took place, the effect of the winter on the condition of the plant, the degree of protection afforded by snow, the extent of the damage, if any, done by the Hessian fly, and the condition of the growing crop at the date of the report. As this return includes the figures on winter wheat and has an important bearing on the probable character of that crop the replies to these inquiries merit special care and attention. Suggestions as to the reporting of condition will be given further on.

20. See the paragraph under "General suggestions," in regard to noting the effects of weather, insects, etc., on the growing crops. This is especially important in those parts of the country where the season is well advanced at this date.

21. In relation to farm animals, it contains inquiries as to the comparative health of horses during the twelve months ending with the date of the report (April 1), the comparative condition of cattle, sheep, and swine at the date of the report, the diseases, if any, which have been unusually prevalent among animals of each species mentioned, the number in every thousand that have died during the year from disease (in the case of horses and cattle), from winter exposure (in

cattle and sheep) and from all causes (in cattle, sheep, and swine), and finally (in respect to swine), the number of breeding sows on hand compared with the number on hand at the same date the preceding year.

22. The estimate as to health of horses and condition of cattle, sheep, and swine is made in the form of a percentage. Normal health or condition[1] is represented by 100, and extraordinary freedom from disease or unusual fullness of flesh might require a figure somewhat above 100, while an unusual prevalence of disease or poorness in flesh would require a figure falling below 100 in a degree corresponding to that in which healthfulness or condition falls short of the normal standard. In the selection of a figure to indicate the actual condition with substantial accuracy, there is a demand for the exercise of much care and judgment on the part of the correspondent, but an essential preliminary is that all practicable means shall have been taken to provide a solid basis for the estimate in the form of a good knowledge of the facts.

REPORT FOR MAY.

23. The circular returnable on the 1st of May calls for a further report on the condition of winter grain—wheat, rye, and barley. In the more southern States the crop is by this date well advanced, and in the absence of mishap during the subsequent stages of its growth and maturation its condition at this time will give an approximate indication of the character of the yield. The bulk of the crop is, however, grown in States in which the harvest occurs at a later period. But in both cases alike much interest attaches to the condition of the growing crop, especially the wheat crop. In a few counties in the extreme South this may be the last report on the condition of small grain.

24. The condition of spring pasture and the proportion of plowing done up to May 1, as compared with the proportion done up to the same date in an average year, are among the important data called for by this circular. The question in relation to spring plowing relates to all plowing in preparation for the planting of any of the spring crops, but, of course, does not refer to any done in the after cultivation of the growing crop.

25. Still another item of great interest on which returns are made at this date from the cotton-growing States is the proportion of the proposed area already planted in that crop and the proportion planted by the same date in an average year. The returns under these two heads show not only the proportion of the crop that is in by May 1, and whether this is greater or less than in average years, but also whether the season is earlier or later than usual, which is an important element in calculating the chances of the crop. Another inquiry contained in

[1] By "normal health" is meant freedom from any unusual disease and from an unusual prevalence of any disease whatever. "Normal condition" is such a condition as is common at the same date in ordinarily favorable years.

the same circular is intended to ascertain whether the total area under cotton is likely to be greater or less than that of the preceding year. The answer as to the contemplated acreage is expressed in the return as a percentage of the area of the previous year.

26. Another inquiry included in the same circular relates to the area in each of the principal crops, as indicated by any noticeable tendency to change the usual proportions between them. The probable increase or decrease in the area under any crop is asked for, and also a statement of the cause for the anticipated change. This return affords an early indication on the subject of acreage in advance of the formal figures on that subject. Experienced correspondents will, of course, be on their guard against exaggerated views of tendencies to increase or decrease, which are in reality very slight or scarcely perceptible; but where such tendencies are at all marked it is very important to note them, since, in the aggregate, they show how the farmers of the country are responding to the influences which bear on their prosperity and adapting their course to the peculiarities of the season, the state of the markets in which their produce finds sale, or to other conditions on which their success is dependent.

27. It is especially advisable, from this time on, through the growing season, to note with care those peculiarities of the weather and other causes by which the condition of the growing crops is so largely determined. See the paragraph on this point under the head of "General suggestions."

REPORT FOR JUNE.

28. The circular returnable on the 1st of June derives peculiar importance from the fact that it is the one on which are made the returns as to the area under wheat, rye, barley, oats, and clover, and also as to the area under rice in those parts of the country in which that cereal is grown.

29. The annual return on area, as proved by the figures of subsequent State or National censuses, have been sometimes too low and sometimes too high, for a tendency to a conservative estimate may have either effect, according as the movement is actually toward greater or less acreage. In counties that are growing in agricultural population, whether by natural increase or by immigration, or by both combined, and in which the aggregate area under cultivation is undergoing a progressive enlargement from that cause, the influence of this circumstance should not be overlooked in making the estimates for the different crops, especially those to which newly broken ground is most apt to be devoted. In sections where there is a progressive abandonment of a crop, on the other hand, because from its readier importation it has ceased to pay, reporters should observe this tendency and be on their guard against excessive estimates.

30. The returns on area are made in the form of a comparison with the area of the previous year, the latter being represented by 100 and

an increase of 5 per cent being indicated by returning the present acreage as 105, while a decrease of 5 per cent would be indicated by a return of 95; and so on for other percentages of increase or of decrease. The Department is desirous of obtaining fuller and more detailed information on crop areas than has hitherto been furnished, and additional remarks on this subject will be found farther on, under the heading "Reports on area."

31. The same circular contains an inquiry as to the average condition of wheat, rye, barley, oats, clover, spring pasture, apples, peaches, cotton, and rice on the 1st of June. The returns on this subject are made in the form of a percentage of full or normal condition. See "Reports on condition," farther on.

32. Other questions contained in this circular relate to the date at which sowing or planting begins and ends in the case of spring wheat, rye, barley, oats, and cotton. Correspondents are requested to give the average date of planting, taking one season with another. The first date should show when, under ordinary conditions, planting would be expected to begin, and the last should show when regular planting should be finished. Close of planting refers to the end of the regular planting, and not to replanting a complete stand. See the paragraph under "General suggestions" in regard to noting the effects of weather, insects, etc., on the growing crops.

REPORT FOR JULY.

33. The circular returnable on July 1 calls for the area as compared with that of the preceding year under crops, which, in some parts of the country, are not fully planted by the 1st of June. These include corn, potatoes, sweet potatoes, beans, sorghum, and tobacco. It also calls for the average condition on July 1 of these crops, that of all the grain crops not harvested prior to that date, and that of cotton, clover, timothy, pasture, apples, peaches, and grapes. The same circular contains an inquiry as to the quantity of wool sheared compared with that of the preceding year and the average weight of fleeces in pounds.

34. The reports on the condition of wheat, rye, barley, and oats made in this circular will, in a large portion of the country, be the last reports on that subject prior to the harvest, and, if carefully made, will afford the means for a pretty accurate forecast of the yield of these crops within that belt of territory, subject, of course, to the possibilities of adverse weather conditions between July 1 and the garnering of the grain.

35. In this report is also included the last return from the wheat crop of the preceding year, the percentage still on hand July 1. On most farms the old stock will at this date be substantially exhausted, and it will very rarely amount to 10 per cent on the average for the whole country; but it is desirable to ascertain precisely the wheat reserve at its lowest point.

36. The remark under "General suggestions" as to the careful observation of the effects of weather, insects, etc., is at no time more important than during this portion of the season. In those portions of the country in which grain, hay, or clover is cut during June, the condition of the weather during harvest and the condition in which the crops are secured should be reported. If the harvesting of any crops is completed the fact should be stated, and if the harvest is begun but not finished at the date of the report, its stage of progress should be approximately indicated, the crops so affected being specified.

REPORT FOR AUGUST.

37. The circular returnable on August 1 provides for a return on the area under buckwheat, the average condition of all the growing crops, including fruit, and of pasture, the product of clover expressed as a percentage of a full crop, and the average quality of clover hay, also expressed as a percentage, high quality being represented by 100. Careful observation on the character and effects of the weather, and on insects or other agencies affecting the condition of growing crops, continues to be important. The condition of the weather during harvest and the condition in which the crops harvested during July have been secured should be reported, as also should the stage of the harvest and the conditions under which it is progressing where it is still in progress at the date of the report.

REPORT FOR SEPTEMBER.

38. The returns on condition made in the report returnable on September 1 include those which relate to the condition of the small grains—wheat, oats, rye, and barley—when harvested. These returns are of great importance as furnishing one of the elements for an estimate of the product of these crops, and they consequently demand the utmost care both in collecting the necessary facts and in making up from these facts a judgment as to the average condition for the country. The whole subject of reporting on condition is more fully discussed farther on.

39. The reports for this date on the condition of corn and other crops still outstanding in a large part of the country, are near enough to the time for the gathering of these crops to have especial significance as indications of the probable amount and quality of the yield. Storms, early frosts, or other adverse influences may, of course, prevent the fulfillment of expectations formed on the basis of these reports, but it is only in exceptional cases that these are sufficiently general to affect materially the character of the crop in its entirety.

40. This circular also contains inquiries on the following points:

(*a*) The product of the peach crop compared with that of a normal year.

(*b*) The number of hogs for fattening compared with that of the previous year.

(*c*) The average condition of hogs as to weight and size.

(*d*) The acreage in clover seed compared with that of the previous year.

(*e*) The condition of the clover-seed crop.

41. Space is left for "Remarks" upon the circumstances affecting the growth and maturity of products named in the schedule and on causes of failure, etc. In those parts of the country where the small grains are harvested wholly or partially in August, reports as to the character of the harvest and the conditions under which it occurred should be made under the same head.

General statements relating to such specialties as cranberries, hops, flax, hemp, etc., will also be interesting.

42. In reporting on the number of stock hogs for fattening, the various circumstances by which an increase or decrease of number has been promoted should be considered and should be mentioned in the remarks accompanying the numerical return. The price of pork, the comparative scarcity or abundance of feed, and the prevalence of disease or its comparative absence are among the matters that will claim attention in connection with the reply to the questions on hogs in this circular

REPORT FOR OCTOBER.

43. The circular returnable on October 1 is especially important. It contains inquiries as to the average yield in bushels and average quality of wheat, rye, oats, and barley; as to the *prospective* yield of cotton, in hundredths of a bale per acre; and as to the product of hops compared with a full crop, the yield of hops per acre in pounds, and their average quality compared with high medium grade. It also asks the condition of crops still growing, including corn, buckwheat, rice, potatoes, sweet potatoes, tobacco, sorghum, other sugar cane, and cotton.

44. The questions in regard to condition are answered as usual in hundredths of full condition, and those in regard to quality in hundredths of high medium grade.

45. The questions in regard to the average yield per acre of wheat, oats, rye, and barley are especially important. The returns on comparative acreage made in an earlier schedule furnished one of the elements from which the total product is calculated. The returns on condition at harvest furnish an important indication on the same point, and those on yield per acre should furnish a still more precise one. If these last and the previous returns on acreage are both correct, the two together supply the factors from which the total product can be correctly computed; and if the condition at harvest was also correctly estimated, the indication furnished by that estimate will harmonize with the results obtained by computation from the acreage and yield.

46. It must be borne in mind that the yield per acre wanted is not the yield on the best farms, but the average yield for the entire area harvested, from that on which the crop was most abundant down to that on which it was nearest to an absolute failure. But the mean between the two extremes must not be taken as the true average. Thus, if the lowest yield of wheat were 5 and the highest yield 45 bushels per acre, the mean would be one-half of the sum of these two quantities, or 25 bushels per acre; but the true average would usually be something less, because the areas with comparatively low yields are usually more extensive than those with high ones. The true average is that which would be obtained if the entire wheat product of the county, as expressed in bushels, were divided by the entire number of acres from which it was obtained; and the same is, of course, true as to each of the other crops. It is important that this be carefully kept in mind, as otherwise the tendency would be to estimate the average yield per acre too high. The subject is more fully considered further on under the head of "Reports on condition and yield."

47. The inquiry concerning the "condition" of cotton is made as in circulars of previous months, and as it is the last of the season it is one of great importance, indicating closely the result of the harvest with a season of average length and medium weather for picking. The question concerning "prospective yield" is intended to afford another and a parallel test of comparative production and is direct and unmistakable in meaning, asking for the expected yield under existing conditions in hundredths of a bale. We find that in the census year 1889 the average yield per acre for the whole country was 0.37 of a bale; while of State averages we have 0.14 for Virginia, 0.25 for Tennessee and Florida, 0.26 for Missouri, 0.29 for North Carolina and Kansas, 0.33 for Alabama and Kentucky, 0.36 for Georgia, 0.37 for Texas, 0.38 for South Carolina and Oklahoma, 0.40 for Mississippi, 0.41 for Arkansas, and 0.52 for Louisiana. A few counties range between 0.70 and 0.90. As a variation scarcely exceeding 0.05 in the general average will make a discrepancy of 1,000,000 bales, it is important that sound judgment should be exercised in the estimate. The question will be understood by all, and a serious inaccuracy can only come from defective judgment. It is important that the inquiry should be deliberately considered.

REPORT FOR NOVEMBER.

48. The circular returnable on November 1 calls for the average yield per acre of corn (in shelled corn), potatoes, sweet potatoes, tobacco, hay, buckwheat, cotton (lint), sorghum (sirup), and rice. The yield of corn, potatoes, sweet potatoes, buckwheat, and rice is stated in bushels, that of tobacco and cotton in pounds, that of hay in tons, and that of sorghum sirup in gallons. In the more important of these crops the average quality expressed in hundredths is called for.

49. The indicated product compared with that of the preceding year is called for in the case of cotton and sugar cane, other than sorghum, while the product of grapes, apples, and pears is to be reported in the form of a percentage of a normal crop, by which is meant a reasonable estimate of a fairly full crop in the particular county.

50. What has already been said as to the importance of the estimates on yield per acre in the case of the small grains is equally applicable to the crops for which an estimate is made in the circular here under consideration. It will be borne in mind that, as already stated in connection with the crops of small grain, the average yield is that which would be obtained if the entire product of a crop were divided by the entire number of acres from which that product was obtained, including even the areas, if any such are comprised in the aggregate acreage returned, on which there was a total failure. A tendency to overestimation of the yield per acre has already been remarked, and the need of guarding against it is evident. On the other hand, the estimate of the total crop of a county in comparison with that of the preceding year is apt to be too low, for a full or normal crop is sometimes mistaken as the standard of comparison, and the tendency to underestimation upon this point will need to be guarded against in the case of those crops for which the estimate is returned in this form.

51. Particular attention is called to the cotton estimate. The first query in the schedule requires an estimate of the number of pounds per acre indicated by the condition of the crop at the date of return, without reference to any former period. The second query calls for a comparison with the crop of last year. In taking into account any causes of failure this year, similar or other causes affecting last year's crop should be carefully called to remembrance before the comparison is made.

REPORT FOR DECEMBER.

52. The circular returnable on December 1 calls for an estimate of the total product, compared with that of the preceding year, in the case of corn, wheat, rye, oats, barley, buckwheat, potatoes, sweet potatoes, leaf tobacco, hay, cotton, and sorghum molasses. It also calls for information as to the average price of each of these products at the date of the return, for estimates as to the areas sown with winter wheat and winter rye, respectively, compared with the areas sown with the same grains a year before, and for a report as to the condition of these two crops at the beginning of December.

53. The return as to the total product of the several crops named above in comparison with that of the previous year is made in the form of a percentage. The product of the previous year is taken as 100. If in any case the product is estimated to be just equal to that of the previous year, the estimate will be represented by 100; if it is estimated to be greater than the previous year's product by one-tenth, the estimate will be represented by 110, and if it is estimated to be less by

one-tenth, the estimate will be represented by 90. This estimate refers to the total product without regard to the area on which it is produced. That is, if the county produced 1,000,000 bushels of corn the previous year and 1,500,000 bushels in the year for which the report is to be made, the crop of this latter year will be represented by 150, no matter whether the increase is the result of increased area or of a larger yield per acre.

54. The last reports on condition, taken in connection with those on area previously made, and with the figures on the previous year's area and on normal yield, afforded one means of calculating the total product for the year. The returns on yield per acre, taken in connection with the area, afforded another; and now a third is supplied by the estimate comparing the crop with that of the previous year. If the previous crop of a county was 1,000,000 bushels, and the new crop is reported at 120, a simple computation shows that the latter will amount to 1,200,000 bushels. Or if, under the same circumstances, the new crop is reported at 80, computation from the data at command will show that it amounts to 800,000 bushels.

55. If the estimates on condition, yield per acre, and total product, compared with that of the previous year, give results that substantially agree, the fact affords evidence of perfection in reporting; of sound and accurate judgment in all the returns of the year. This is the ideal at which the correspondent should aim. Often there is substantial agreement; sometimes discrepancies more or less marked. These discrepancies require adjustment, for which further investigation is sometimes necessary. Often, perhaps generally, the result by "yield per acre" is higher than that by "product compared with last year." This discrepancy is, no doubt, largely due to too high an estimate of yield per acre, which is a not uncommon failure of agricultural reporters; but there is every reason to believe that it is due in part to underestimates of the crop as compared with that of the previous year, since this also is a very prevalent defect in crop reporting. Every effort should be made to avoid both of these sources of error.

56. *The new crop.*—The area sown and condition of winter grain should both be given comparatively, 100 representing the acreage sown the previous year, and also a full normal condition of the growing crop, an increase or decrease of acreage or condition being indicated by a higher or lower figure.

57. *Prices.*—A little inquiry, and some subsequent calculation, will enable correspondents to fix upon a price which may be a fair average of prices received at the home markets, the county towns, and local railroad stations. Prices should be stated plainly in *dollars and cents.*

REPORTS ON AREA.

58. In the reports on the acreage under different crops, made for the most part in the latter end of May each year, the number 100 represents the area under the same grain at the corresponding date in the

year preceding that for which the report is made, and the figures returned indicate that the area of this latter year bears such a relation to the one immediately preceding it as the figures themselves bear to 100. Thus a report of 90 for the area under wheat at the end of May, 1895, would indicate that this area was equivalent to 90 per cent, or nine-tenths of that which was occupied by the same grain at the end of May, 1894. On the other hand, a report of 110 would indicate an increase of 10 per cent, or one-tenth, as compared with last year's acreage.

59. In addition to the reports heretofore made in that form, the Department now desires to obtain estimates of the actual area under each of the principal crops in each county; and in cases where a county presents well-marked differences of soil and surface, it is desirable to obtain as accurate an estimate as possible of the proportions of the total area comprised in the different kinds of land. Thus if one part of the county is hill land and the other part level or valley land, or if one part has a light sandy soil and another a deep vegetable loam, it is desirable to ascertain approximately in what proportions these two kinds of land contribute to make up the total area under each of the crops whose acreage is reported. The same principle holds good for a greater number of varieties, if the distinction between them is sufficiently broad and the aggregate amount of each kind is sufficiently great to make them worthy of a separate estimate. It is, of course, impracticable to notice all minute differences, but in many cases there are well-marked distinctions applicable to large areas, of which account can be taken without any special difficulty.

60. In some cases, too, there are differences in the methods or quality of the cultivation which it may be practicable to take account of. Thus, one part of a county may consist chiefly of large and another chiefly of small farms; or one may be chiefly occupied by well-to-do farmers amply provided with the facilities for superior cultivation, while another may be mainly settled by men with scanty capital who are hampered by that circumstance in their efforts to make the best use of their land. It is impossible, within the compass of this little manual, to multiply illustrations, but our correspondents will readily perceive whether there is in their own counties any such broad difference in the character of the cultivation, and in its effect on the yield of crops, as to merit special attention and justify an effort to estimate the proportion of each crop area affected by each kind of culture.

REPORTS ON CONDITION AND YIELD.

61. In reporting condition, 100 stands for a full crop. A crop falling one-tenth short of a full crop is therefore indicated by 90; one falling one-fourth short is indicated by 75, and one falling short by one-half is indicated by 50.

62. In British India the number 16 is taken as a standard, a crop one-sixteenth short of a full crop being indicated by 15; one that is one-eighth short by 14, etc. This method appears to have been adopted because the Indian monetary unit, the rupee, is divided into 16 annas, and the people are, therefore, most familiar with reckonings by sixteenths. It is, in fact, customary there to speak of a full crop as a 16-anna crop; a crop deficient by one-eighth as a 14-anna crop, etc. This figurative application of the name of a piece of money to the crop is frequently met with and is rather mystifying to those not acquainted with the reason for the practice adopted.

63. Our own division into hundredths coincides with the division of our dollar into cents, as the Indian division into sixteenths coincides with the division of the rupee into annas; but it has the advantage of admitting of finer distinctions than the Indian system and has a tendency to foster among the estimators the habit of making closer observations and noting slighter shades of difference in the condition of the crops. It also has a like advantage in the working out of averages, and on the whole is believed to be conducive to greater accuracy than is attainable by the rougher estimate which a division into sixteenths implies.

64. By the "full crop," for which 100 stands in our system, is meant a crop showing healthy growth and a condition unimpaired by weather, blight, insects, or any other damaging agency. It is such a crop as, under these circumstances, would be produced upon the kinds of soil and with the methods of cultivation that are in general use in the county for which the estimate is to be made. It does not represent a crop of extraordinary character, such as may be produced here and there by the special effort of some highly skilled farmer with abundant means and leisure at his command, or such as may be grown on an occasional bit of land of extraordinary fertility, or even such as may be grown quite extensively once in a dozen years, in a season that is extraordinarily favorable to the crop to be rated. A crop produced under any one of these rare and exceptional conditions, and still more one produced under two or more of them combined, may require much more than 100 to represent it. For example, the hay crop, when warm, moist weather in spring and early summer has been followed just in the nick of time by a bright, dry season for the ripening of the luxuriant growth, may require a figure above 100 to represent its condition in the section so exceptionally favored; and in the special cases in which the exceptionally favorable character of the season is combined with extraordinary fertility of soil, or some other exceptional condition, the excess above 100 would rise still higher. Nor is the "full crop" merely an average crop, the mean product of a series of years. It is, in short, a normal crop, neither deficient, on the one hand, nor yet extraordinarily heavy on the other. It is the crop which answers reasonable expectation, soil and climate being considered.

65. It has, perhaps, scarcely been necessary to say this much in explanation of what 100 represents. It is believed that in nineteen cases out of twenty the estimator would of his own accord, and almost without giving the matter a thought, adopt as his standard of comparison, represented by 100, precisely the kind of crop which is here in view. He would not take as such standard an extraordinary crop, such as he only sees once in a long while, nor would he take an average crop, ascertained by adding the yields of several years comprising good, bad, and indifferent seasons, and computing therefrom the arithmetical mean. What he would naturally and almost unconsciously do is to make his comparison with such a crop as is familiar to his sight and to his mind; such an one as he may see anywhere and everywhere about him in any ordinarily favorable season, and in the absence of any appreciable damage from drought, floods, frost, storms, blight, insects, or other injurious agency. If elaborate explanation of what is desired should lead an estimator to distrust this simple, easy, and natural process, which he would of his own accord adopt, it would be mischievous instead of helpful; and to a great majority of the correspondents of the Department it would probably be perfectly safe to say: "In forming your idea of the standard of comparison which is to be represented by 100 in your estimation of the condition of the crops, just pursue the same plain, common-sense course which you have pursued in the past, and you will then be as near right as it is practicable to get." Still, if it be borne in mind that the use of the standard here described does not require any intricate and elaborate mental operation, but simply that exercise of observation and judgment which is habitual with the experienced agriculturist, the discussion of the subject can do no harm, while it may, on the other hand, be helpful to some of the less experienced of our correspondents. It is precisely because this standard of comparison is more easily applied and more natural than any other that the Department has adopted it rather than the average of all crops, good and bad, the crop of the census year, etc.

66. It is, of course, understood that each correspondent has to do simply with his own county. What is a "full" or "normal" crop in one county is not necessarily such in another. The correspondent in a county having a light, thin soil will have a very different standard from that used by the correspondent in the county in which most of the farms are on unexhausted prairie loam many feet in depth. What would be a "full" or "normal" crop of corn, for example, in the former would be a very scanty one in the latter. So great may be the difference that the same crop which is properly represented by 100 in the one case would stand for much less than 50 in the other; or, if we reverse the cases, the corn crop which in the fertile prairie county would be properly represented by 100, would be so prodigiously large and so far beyond the range of all ordinary experience in the other county that

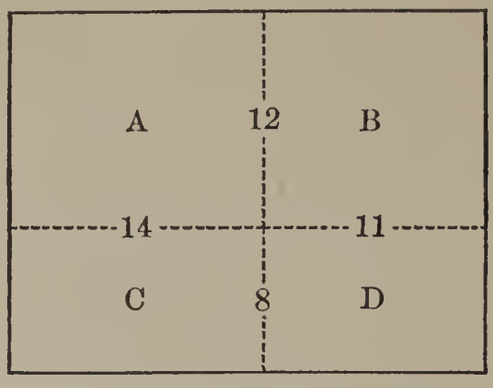
if by some miracle of the seasons it could for once be grown there, in that county it would require more than 200 to represent it. But a correspondent has no occasion to embarrass himself with any consideration of the crops and crop standards of other counties. Each one has to do with what constitutes a full or normal crop in his own county according to the teachings of familiar experience there; and having mentally represented this full or normal crop by 100, he is to rate the actual condition of the crops at any given time at such a proportional figure as in his best judgment will express its relation to this standard.

67. It is true that where a county comprises two or more portions characterized by well-marked differences in quality of soil or general character of cultivation, the accurate determination of the average condition for the county is not so simple as in counties in which the conditions are substantially uniform throughout. The proper method in such a case is for the correspondent to make up his own mind as to what constitutes a full or normal crop in each division of the county, estimate the actual condition of the crops in each division on the basis of the standard thus fixed upon, express this condition in hundredths of the same standard, and then proceed to deduce the average for the county and express it in hundredths of the normal county average. In this he would have the aid of his assistants, and there would be an advantage in assigning to each assistant, as far as practicable, such a portion of the county as is marked throughout by similar conditions of soil and cultivation. This done, there should be a clear understanding between the correspondent and each assistant as to the meaning of 100, or, in other words, of a full or normal crop, in that part of the county which the assistant represents.

68. To this end it is necessary that the full or normal crop should be conceived of in an exact quantitative way. In some cases the correspondent may have in his mind as a normal standard the appearance of such a growing crop as may be considered a full or normal one; but before he can make it the basis for a computation, as one of the data to be used in obtaining the average normal crop of his county, he must determine in his own mind to what rate of yield such an appearance corresponds. In the case of wheat, for example, he must not only have a mental notion of the *appearance* of a full crop, as it stands in the field, on soil of a particular character, but he must also have a mental estimate of the number of bushels per acre which a crop of such appearance will yield if harvested without loss or impairment. And the formation of an approximately correct estimate on this latter point is worthy of careful attention and painstaking effort.

69. The method of arriving at an average of condition for a county in which different portions are distinguished by well-marked differences of soil or cultivation may be made clearer by an illustration. Let the following figure represent a county in which the divisions A, B, C, and D

represent portions, each one of which has certain characteristics that in a general way distinguish it from the others:



70. On the basis of one-sixteenth of an inch to the linear mile, A will contain 168, B 132, C 112, and D 88 square miles, making 500 square miles in the county. Let us assume that the wheat areas in these four divisions are, respectively, 6,720, 6,600, 5,040, and 4,840 acres, making 23,200 acres in all, and that the normal yield is, in A 18, in B 16, in C 14, and in D 12 bushels per acre. Let us also assume that condition is estimated at 85 in A, 90 in B, 95 in C, and 100 in D. We shall then have the results indicated in the following table:

1	2	3	4	5	6
Divisions.	Area under wheat.	Normal yield per acre.	Normal product on actual area.	Estimated condition.	Product corresponding to estimated condition.
	Acres.	*Bushels.*	*Bushels.*	*Per cent.*	*Bushels.*
A	6,720	18	120,960	85	102,816
B	6,600	16	105,600	90	95,040
C	5,040	14	70,560	95	67,032
D	4,840	12	58,080	100	58,080
Totals and averages	23,200	15.31	355,200	90.9	322,968

71. The figures on normal product (column 4) for A, B, C, and D, respectively, are, of course, obtained by multiplying the areas in column 2 by the normal yields per acre for the same divisions, as given in column 3; and the total normal product is obtained by adding the figures for the several divisions.

72. Let us take as an illustration the method pursued in the case of division A. The correspondent ascertains the number of acres, or makes an estimate thereof, and sets the figures in column 2. His estimate of the normal yield per acre for the same division he sets in column 3. The next operation is indicated as follows:

Number of acres	6720
Bushels per acre	18
	53760
	6720
Number of bushels produced	120960

73. As the multiplier (18) is the estimated normal product per acre, the product (120,960 bushels) is the normal product on the actual area,

and the figures are accordingly set in column 4. The correspondent makes his own estimate of condition and sets it in column 5. In the case of division A we have assumed this estimate to be 85. The next step is to ascertain the product corresponding to this estimated condition, and this is indicated below:

Normal product on actual area (bushels)	120960
Estimated condition	.85
	604800
	967680
Product corresponding to estimated condition(bushels)	102816.00

74. In this case we treat the multiplier as a decimal, since it represents hundredths of a full or normal crop, and according to the rule for multiplication of decimals, we mark off in the product two decimal places, that being the number of decimal places in the multiplier with none in the multiplicand. We thus obtain 102,816 bushels as the product corresponding to the estimated condition. We therefore set down 102,816 in column 6.

75. Proceeding in a like manner with each of the other divisions, we find the figures on "normal product on actual area" and "product corresponding to estimated condition" to be those given for the same in columns 4 and 6, respectively.

76. In the case of division D, the estimated condition is 100. That is, the crop is there estimated to be normal, and the figures set down in column 4 as the "normal product on the actual area," namely, 58,080 bushels, are consequently the figures which express the "product corresponding to actual condition," and are also set down in column 6.

77. The totals in columns 2, 4, and 6 having been found by addition to be 23,200, 355,200, and 322,968, respectively, how shall we proceed to find the averages? The area being what it is in the several divisions, the average normal yield on the total number of acres will be found by dividing the total normal product (355,200 bushels) by 23,200, this being the total number of acres. The quotient obtained by this division is 15.31; and areas, normal yields, and figures on condition for the several divisions being such as they have been assumed to be, the average normal yield for the county would, therefore, be 15.31 bushels per acre. This, however, could not be regarded as a permanent normal average, since it would be subject to more or less disturbance from year to year by changes in the comparative areas in the several divisions. The figures 15.31 are, however, properly inserted at the foot of column 3 as the average normal yield for the county under all the conditions assumed in the construction of the above table; and in the absence of any material change in the relative areas in the different divisions, it would be the approximate normal average for the county as long as the normal yields for the several divisions remained unchanged.

78. How shall we now proceed to find the average condition for the county? We have found that the total normal product on the actual area is 355,200 bushels and that the total product to be expected in view of the conditions in the several divisions is 322,968 bushels. One per cent of a normal product would be one hundredth of 355,200 bushels, or 3,552 bushels; and 322,968 bushels will be as many times 1 per cent of a normal product as 3,552 bushels are contained times in 322,968 bushels. If we perform this division we get a fraction over 90.9, and this quotient indicates that, on a general average for the county, the condition is such as to give a little over 90.9 per cent of a full or normal crop. The average condition for the county is, therefore, set down at the foot of column 5 as 90.9. These figures, as ordinarily used by our correspondents in their reports, would mean that the condition is such as to promise 90.9 per cent; that is, a little less than ninety-one hundredths of a full or normal crop; and this is also what they do mean in the table. That is, they mean that area, normal yield, and condition in the several divisions being as there assumed, the prospect for the county as a whole would be 90.9 per cent, or a little less than ninety-one hundredths of a full or normal crop.

79. An erroneous method, sometimes used in getting an average of condition, is to add up the figures on condition for the several divisions and divide the sum by the number of divisions. The sum of the divisional figures on condition in column 5 is 370, and as the number of divisions is 4, the erroneous method in question would be to divide 370 by 4 and accept the quotient (92.5) as the average condition for the county. This differs by 1.6 from the quotient obtained by the correct method.

80. While a certain yield per acre may at any given time be regarded as the normal yield of a particular county, or of such portion of a county as is distinguished by certain well-marked characteristics of soil, surface, or cultivation, it would not be safe to assume that it will remain so for a long series of years. As a virgin soil gradually declines in fertility through continuous cropping without returning to it an equivalent for the chemical constituents thus withdrawn, or as an impoverished soil is gradually restored to fertility by improved farming, the normal product changes; for this phrase is here used to mean the product obtainable in an ordinarily favorable season under the conditions of soil and cultivation generally prevailing at the time, and when these conditions change the normal product necessarily changes with them. So, also, in a county composed of different parts, each distinguished by well-marked conditions of its own, the normal average for the county would, as already pointed out, be affected by any material change in the relative areas under the crop to be estimated. Thus, in the supposititious case considered above, a gradual increase of the area under wheat in divisions A and B and a falling off of the areas in divisions C and D would raise the normal average yield of

wheat for the county, although the normal yields for its several divisions should remain unchanged.

81. In the supposititious case just referred to, the county considered is assumed to be divided into distinct portions, each having its own characteristics of soil, surface, or cultivation; but in actual experience it is more likely to happen that the leading varieties in the nature of the soil, the character of the surface, or the quality of the cultivation will be more or less intermixed; and the most that can be done in such cases will be to take these varieties into consideration, estimate the normal yield for each variety, form as correct a notion as may be practicable of their comparative weights in contributing to the general average for the county, and thus obtain a more or less close approximation to this county average of normal yield per acre. In the absence of provisions for an annual census of agriculture this must, after all, be largely a matter of general observation and careful judgment; and while the hints that have been thrown out may be useful to some, they are not meant to have the effect of causing the experienced and skillful estimator to distrust the methods which he has hitherto found adapted to the circumstances of his own locality and the necessities of his work as a statistical correspondent. Nor are they meant, even in the case of those whose experience in this work is comparatively small, to hamper them in the use of those methods which their agricultural knowledge and their judgment as practical men may show to be necessary.

82. For estimating the yield per acre the results of the thrashing of the grain afford the most definite and certain basis, but an estimate based on the condition of the standing crop is attainable at an earlier date and may be desirable for certain purposes.

83. A method which has been suggested in Europe for estimating the yield of standing grain when ripe is to construct a frame which when set up in a grainfield will inclose an exact fraction of an acre or hectare, use it to mark off such fraction in fields representing the conditions for which the yield is to be ascertained, and having cut the ripe grain inclosed within it, in any given case, ascertain its actual yield and from that compute the corresponding yield per acre. A frame exactly 11 feet square, which might be made in parts that can be readily and accurately put together when a trial is to be made, would contain one three hundred and sixtieth of an acre. If it were found by experiment that the grain inclosed within such a frame yielded $1\frac{2}{3}$ quarts or five-thirds of a quart, dry measure, the product of an acre of grain in like condition would be 600 quarts, or $18\frac{3}{4}$ bushels. The yield should be weighed as well as measured, and the weighing would give the more trustworthy result of the two, not only because the weight of a quantity of grain is a more accurate determinative of its nutritive contents than is its measure, but also because with such means as can be readily obtained by the estimator, the weight can be determined to a far greater nicety than would ordinarily be attainable

in an attempt to determine the measure. If 2½ pounds of wheat were obtained from the area inclosed within a frame such as has been indicated, the total product per acre for grain of like yield would be 900 pounds. This, at 60 pounds to the measured bushel, would be equivalent to 15 bushels; but the result obtained by weighing would be reported by weight and that with all practicable exactness, while the results obtained by measuring would be reported in bushels and fractions of a bushel. In this way a means of determining the weight per bushel would be furnished.

84. Farmers would, doubtless, be found in any county who would willingly cooperate in making such tests; and even on farms where the yield is generally good, spots would be found that represent with approximate accuracy the condition, and therefore the yield, of poorer fields on other farms.

85. The method just considered might be useful in arriving at an estimate of the normal yield per acre in the different portions of a county having such differences of soil, surface, etc., as have been referred to above. After selecting by the eye a spot judged to be representative of the normal product of soil of a particular class, or of a particular section of a county, the measuring frame might be used to ascertain the yield per acre corresponding to that appearance and condition of the standing grain which led to its selection as fairly representing the normal product of the kind of soil, or section of county, in question. But not to depend entirely on one method, fields of known area might be sometimes selected as fairly representative of the normal yield of the given portion of a county and the owners induced carefully to determine by measure, and if possible by weight also, their actual product.

86. What has been said in regard to wheat will apply in essential particulars to the other small grains. In the case of corn, where the rows and the hills are exactly 3 feet apart, an area containing five hills one way by four the other will represent exactly one two hundred and forty-second part of an acre; and where the corn planter has been used and the distances between the rows accurately fixed, no frame or other means of measurement will be necessary. If, for example, the product of twenty hills should be found to be 6 quarts of shelled corn, the yield of an acre of like corn would be (242 × 6) 1,452 quarts, or 45⅜ bushels.

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